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Original Research Article

Prevalence of Bovine Trypanosomiasis and Its Risk Factors in and Around Zenzelima, Amhara Region, Ethiopia

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Abstract: A cross sectional study was conducted from January 2018 to June 2018 with the aim of determining the prevalence of bovine trypanosomiasis and identifying the circulating species of trypanosomes and assessing possible risk factors in and around Zenzelima, Amhara Regional State, Ethiopia. Blood samples collected from a total of 74 cattle with different breed, age and sexes were subjected for trypanosomiasis screening using thick and thin smear methods. The overall prevalence of trypanosomiasis was found to be 4.1%. *Trypanosoma vivax*, was the only species found in the study area. Cattle with poor body condition were highly infected (4.1%) than medium body conditioned animals (0.0%) with (P=0.031) indicating a statistically significant association. High prevalence was observed in *Gediro* village (2.7%) followed by *Sefatira*. However; there are no positive cases detected in *Sesaberet* village. High prevalence of infection was observed in cross breeds (2.7%) than local breeds (1.4%), however; it was statistically insignificant. Prevalence was slightly higher in females (2.7%) than males (1.4%). Likewise, prevalence rate was higher in adult (2.7%) than in young (1.4%) cattle. Although the current prevalence of trypanosomiasis in the study area is low, treatment of sick animals and vector control strategies should be implemented, particularly in *Gediro* area.

Keywords: Bovine, Prevalence, Smears, Trypanosoma, Zenzelima.

INTRODUCTION

Ethiopia has the largest livestock population in Africa and the 10th in the world. The total cattle population is about 59.5 million, of which females constitute 55.5% and males 44.5%. 98.20% of the total cattle in the country are local breeds. The remaining are hybrid and exotic breeds that accounted for about 1.62% and 0.18% respectively (CSA, 2016/17). However, the contribution from this huge livestock resource to national income is disproportionally small due to several factors. From those factors, bovine trypanosomiasis is one of the most prevalent and important disease in Ethiopia, which is limiting the livestock productivity and agricultural development (Abebe and Jobre, 1996). The disease is highly prevalent in the most arable and fertile land of the country. The most important Trypanosoma species affecting cattle in Ethiopia are *Trypanosome Congolese*, *T. vivax* and *T.brucei* (Shimelis Dangachew, 2011). The disease mainly transmitted by tsetse flies (cyclically) and biting flies (mechanically) (Ahmedin Jemal and Hugh Jones, M.E. 1995). Mechanical transmission is particularly important in relation to *T. vivax* particularly on free of tsetse infested areas. It can occur in the presence of biting flies of genus Tabanus, haematopia, chrysopl and stomaxys (Abebe Getachew, 2005).

Tsetse flies in Ethiopia are confined to southwestern and northwestern regions between longitude 33° and 38° E and latitude 5° and 12° N covers an area of 220000 km². The low lands and in the river valleys of Blue Nile, *Baro*, *Akobo*, *Didessa*, *Ghibe*, and *Omo* are tsetse fly infested part of the country (Taye Itefa Gemtessa and Kumela Lelisa Dera, 2017). Animals infected by trypanosomiasis are manifested by anemia, generalized enlargement of lymph nodes, loss of body condition, rough hair coat, fever and loss of appetite (Urquhart GM, 1992 *et al*.,) Trypanosomiasis can affect directly the milk and meat productivity of animals, reduces birth rate, increase the abortion rate and mortality rate; all of these affect the herd size and herd composition. Indirect impact of trypanosomiasis mostly lies on crop production through the availability and cost of animals that provide traction power. It can reduce work efficiency of oxen used for cultivation, reducing access to animal traction or discourages the introduction of draught animals in to crop farming (Tesema Dumesa and Yitayew Demessie, 2015).

In recent years a number of drugs against bovine Trypanosomiasis have been introduced for both curative and prophylactic use (Soulsy by JEL, 1982, Nuru Ahmed, 1993). Control strategies are mainly concentrating on vector control, parasite control with chemotherapy and chemoprophylaxis and herding Trypan tolerant breeds (Abebe Getachew, 2005). However, current data about bovine trypanosomiasis is in and around Zenzelima is scarce. Moreover, cattle visiting in the veterinary clinic, College of Agriculture

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and Environmental Sciences were frequently treated by trypanocidal drugs based on tentative diagnosis. This study is, therefore, conducted with the following objectives.

- To estimate the prevalence of bovine trypanosomiasis in *Zenzelima Kebele*.
- To identify potential risk factors associated with trypanosomiasis in the study area.

MATERIAL AND METHODS

Study Area Description

The study was conducted from January 2018 to June, 2018 in and around *Zenzelima Kebele*, Bahir Dar zuria woreda, west Gojam administrative zone. Bahir Dar is the capital city of Amhara regional state, which is found 565km away from Addis Ababa, northwest of Ethiopia. The altitude of the area is 1500 to 2600 m.a.s.l. Bahir Dar is located between 12^0 29'N latitude and $37^0$29'E longitude with an average annual rain fall ranging from 1200 to 1600mm, annual temperature ranging from 8 to 31^0c. About 70% of the land is featured by plain platues and covered by various bush formation, low weeds mainly ever green lands, some semi-humid highland vegetation planted with major agricultural products. The study area has livestock population 14658 in which (8438 cattle, 1745 equine, 660 sheep, 240 goats, 3575 poultry) (*Zenzelima Kebele agriculture sector, 2017*). The biggest lake and river in Ethiopia, Tana and Blue Nile (Abay) are found in this area.

Study Animals

The study animals were cattle that found in the selected areas of *Zenzelima Kebele*. The cattle include both cross and local breeds. A total of 74 cattle of both age groups and both sexes from 24 households were studied. The age of cattles were determined as young (1-3) and adult (>3).

Study Design and Sampling Technique

A cross-sectional study design was used to determine the prevalence of bovine trypanosomiasis and its associated risk factors in and around Zenzelima Kebele. Breed, age, sex, body condition and site were considered as the risk factors during the study. One stage Cluster sampling was used to select 24 households. All cattle above one year of age were selected and studied from all households.

Sample Size Determination

The desired sample size for the study was determined using the formula given by thrusfield (2005) with 95% confidence interval, 5% precision and 1.8% expected prevalence (Yitayal *et al*., 2015) as shown below;

$$n = \frac{(1.96)^2 P_{exp}(1-P_{exp})}{d^2}$$

Where, n = Sample size;
P_{exp} = expected prevalence = 1.8%
1.96 = the value of z at 95% confidence interval
d= desired absolute precision or margin of error = 0.05

$$\mathbf{n} = \frac{(1.96)^2 [0.018(1-0.018)]}{(0.05)^2}$$

n= 27

The required sample size is 27 but to increase precision a total of 74 cattle were examined for the presence of Trypanosoma parasites.

Sample Collection

Blood samples collected directly from the ear vein by tip of clean grease free slide and put on another clean slide to make thick and thin smears. Giemsa staining technique is used to stain the smears and examined for the presence of the parasite.

Data Entry and Analysis

Data collected from each study cattle and laboratory results were coded into appropriate variables and entered into SPSS software. All statistical analysis was performed using statistical package for social science (SPSS, Version20) software. Statistical analysis was made using descriptive statistics and Chi-square ($\chi 2$). The variation in prevalence between different variables (breed, sex, body condition of the animal) was calculated.

RESULTS

Out of the total 74 cattle examined 3/74(4.1%) of animals found positive for *Trypanosoma vivax* infection. A statistically significant difference (P<0.05) was observed within different body condition of animals. From total of 74 cattle examined, high prevalence of infection found in adults (2.7%) than young (1.4%) (Table 1), however, the difference is not statistically significant (P=0.973).

Table 1: prevalence of trypanosomiasis with age

Age	Laboratory results		Total	Chi-square	p- value
	Negative	Positive			
Young	23(31%)	1(1.4%)	24(32.4%)	0.001	0.973
Adult	48(64.9%)	2(2.7%)	50(67.6%)		
Total	71(95.9%)	3(4.1%)	74(100%)		

Out of 74 cattle examined, the number of local and cross breed infected with *Trypanosoma vivax* was 1(1.4%) and 2(2.7%), respectively (table 2). The prevalence of infection is relatively high in cross breed cattle but the difference was not statistically significant (p>0.05).

Table 2: prevalence of trypanosomiasis with breed

Breed	Laboratory result		Total	Chi-square	p-value
	negative	Positive			
Local	55(74.3%)	1(1.4%)	56(75.7%)	3.045	0.081
Cross	16(21.6%)	2(2.7%)	18(24.3%)		
Total	71(95.9%)	3(4.1%)	74(100%)		

Prevalence of *T.Vivax* infection was 2.7 % and 1.4% in female and male, cattle respectively (table 3) but it was not statistically significant (p>0.05).

Table 3: prevalence of trypanosomiasis with sex

Sex	Laboratory result		Total	Chi-square	p-value
	Negative	Positive			
Female	39(52.7%)	2(2.7%)	41(55.4%)	0.160	0.689
Male	32(43.2%)	1(1.4%)	33(44.6%)		
Total	71(95.9%)	3(4.1%)	74(100%)		

The prevalence of trypanosomiasis in selected village of the kebeles was not-significant (p >0.05), however, high infection was found in *Gediro* (2.7%) than *sefaxira* (1.4) (table 4).

Table 4: prevalence of trypanosomiasis with site

Site	Laboratory result		Total	Chi-square	p-value
	Negative	Positive			
Gediro	26(35.1%)	2(2.7%)	28(37.8%)	1.617	0.445
Sesaberet	22(29.7%)	0%	22(29.7%)		
Sefatira	23(31.1%)	1(1.4%)	24(32.5%)		
Total	71(95.9%)	3(4.1%)	74(100%)		

Prevalence of Trypanosomiasis also computed for cattle with different body condition is indicated in (table 5). A statistically significant difference (P<0.05) was observed with in different body condition of cattle. The infection rate in animals with poor body condition was high (4.1%) than in cattle with medium body condition (0.0%) and good body condition (0.0%). This difference was statistically significant (P<0.05).

Table 5: prevalence of trypanosomiasis with body condition

Body condition	Laboratory result		Total	Chi-square	p-value
	Negative	Positive			
Good	13(17.6%)	0%	13(17.6%)	6.933	0.031
Medium	38(51.3%)	0%	38(51.3		
Poor	20(27%)	3(4.1%)	23(31.1%)		
Total	71(95.9%)	3(4.1%)	74(100%)		

DISCUSSION

The present study revealed that the prevalence of bovine trypanosomiasis in the area due to T. vivax was 4.1% (3/74) which was slightly lower than the previous work reported on epidemiological investigation of mechanically transmitted trypanosomiasis (Trypanosoma vivax) of domestic animals in three districts bordering Lake Tana by (Alekaw Sinshawa, 2004) who report 4.5% prevalence. Another studies on non-tsetse transmitted bovine trypanosomiasis in Amhara region by (Cherenet.T *et al*., 2004) and in tsetse controlled areas of Eastern Wollega by (Yibrah T, Semeamlak M.2013) indicate prevalence of 6.6% and 7.5%, respectively.

Our finding is relatively higher as compared to reports in Addisamba and Amarit District of West Gojam Zone, Amhara Region (Abrahm Z and Tesfahewet Z 2012) and in Mecha Woreda of west Amhara region bordering the Blue Nile River (Addisalem HB 2012) both of which indicate prevalence's of 1% and 2%, respectively. The difference may be due to high intervention programs regarding tsetse control thereby decreasing fly density in these sites (Ayana M *et al*., 2012).

The prevalence of trypanosomiasis was computed for the two age categories in this study, young and adult, the difference was statistically insignificant (P=0.973). High prevalence of infection observed in adult (2.7%) than young cattle (1.4%). This finding was in line with previous reports (Sinshaw A *et al.*, 2016) and (Yirdaw Abate *et al*., 2017) who report (2.5%) in adult and (0.9%) in young, (3.8%) in adult and (1.9%) in young respectively.

The prevalence of bovine trypanosomiasis on the basis of body condition showed a statistically significant difference ($P < 0.05$). The prevalence in animal with poor (4.1%) was higher than in medium (0.0%) and good (0.0%). This could be due to differences in the management practices of the farmers. In addition, animals with poor body condition were less resistance as a result of maintenance or presence of other chronic disease and environmental condition that make minimum parasite loads to overcome the host immunity. This result is agreed with (Yirdaw Abate *et al*., 2017), who report (7.1%) in poor and (1.2) in medium body conditioned animals.

Prevalence on the basis of breeds were (2.7%) in cross and (1.4%) in local breeds. This supports the fact that local breeds are adaptable and vector resistant than cross breed. This result is disagreeing with (Yirdaw Abate *et al*., 2017).

The prevalence of the parasite was compared among sex. Higher rate of infection observed in females (2.7%) compared to males (1.4%). However, there was no significant difference in the prevalence of Trypanosomiasis in female animals compared to male animals (P=0.689). This might be due to the fact that both sexes have similar exposure to biting flies in grazing areas and watering points in the study area. This result is in agreement with what was reported previously in Ethiopia by (Abebayehu T *et al*., 2011).

The study also investigates the prevalence difference in sites in which high prevalence was found in *Gediro* (2.7%) than in *Sefatira* (1.4%), this is due to the presence of high biting flies in *Gediro* (around lake Tana) but less flies in *sifatra. T. vivax*, which is transmitted mechanically by biting flies, was the only species found in the study site. This is due the fact that T. vivax has the ability to adapt and establish itself in the absence of tsetse flies. The idea can be more strengthened by the result obtained from the regional laboratory data where Glossina species were not identified in the study area on a survey conducted from 2009 -2011 by (Addisalem HB 2012). The overall prevalence of bovine Trypanosomiasis in an around Zenzelima was 4.1% which is in support of the study done by (Yirdaw Abate *et al.*, 2017), who report 1.8% prevalence.

CONCLUSION AND RECOMMENDATIONS

The present study indicates low prevalence of trypanosomiasis (4.1%), but it is a potential disease that can limit livestock production and productivity in and around the study area. Trypanosoma vivax is the only species that was found in area during the study time. This indicates that the importance of mechanically transmitted trypanosomiasis in the study area. Body condition, age, breed and sex of the animals were important risk factors associated with the occurrence of bovine trypanosomiasis. Based on the above finding, effective vector control measures should be applied in order to reduce the density of biting flies. Veterinary service should be extended to the areas with provision of drugs that can eliminate *T. vivax.* Awareness should be addressed the farmers about the disease, way of transmission and method of prevention. Further epidemiological studies should be conducted including the impact on productivity and its economic loss.

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Availability of Data and Materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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